## Claims

What is claimed is:

1. A dispersion compensating optical fiber, comprising:
a relative refractive index profile having

a central core segment with a positive relative refractive index ($\Delta_1$) and a core outer radius ($r_1$),

a moat segment surrounding the central core segment having negative relative refractive index ($\Delta_2$) and a moat outer radius ($r_2$), and

a ring segment surrounding the moat segment having a positive relative refractive index ($\Delta_3$), a ring center radius ($r_3$) to a center of the ring segment
wherein the relative refractive index profile results in

total dispersion of less than –114 ps/nm/km and greater than –143 ps/nm/km at 1550 nm, and

kappa, defined as the total dispersion at 1550 nm divided by total dispersion slope at 1550 nm, of between 96 and 150 nm.

2. The optical fiber of claim 1 further comprising a kappa, defined as the total dispersion at 1550 nm divided by the total dispersion slope at 1550 nm, of between 107 and 146 nm.

3. The optical fiber of claim 1 further comprising a kappa, defined as the total dispersion at 1550 nm divided by the total dispersion slope at 1550 nm, of between 113 and 127 nm.

4. The optical fiber of claim 1 wherein the total dispersion slope at 1550 nm is less than -0.7 ps/nm$^2$/km and greater than –1.5 ps/nm$^2$/km.

5. The optical fiber of claim 1 wherein the total dispersion at 1550 nm is less than -120 ps/nm/km and greater than -143 ps/nm/km.

6. The optical fiber of claim 5 wherein the total dispersion at 1550 nm is less than -120 ps/nm/km and greater than -138 ps/nm/km.

7. A dispersion compensating module including the dispersion compensating optical fiber of claim 1.

8. An optical fiber transmission system, comprising:

a single mode transmission fiber having a total dispersion between 5 and 14 ps/nm/km at 1550 nm; and

the dispersion compensating fiber of claim 1 optically coupled to the single mode transmission fiber;

wherein for all wavelengths within a transmission wavelength band between 1525 nm to 1565 nm, the transmission system exhibits a residual dispersion of less than ± 10 ps/nm per 100 km of the single mode transmission fiber.

9. An optical fiber transmission system, comprising:

a single mode transmission fiber having a total dispersion between 5 and 14 ps/nm/km at 1550 nm; and

the dispersion compensating fiber of claim 1 optically coupled to the single mode transmission fiber;

wherein for all wavelengths within a transmission wavelength band between 1525 nm to 1625 nm, the transmission system exhibits a residual dispersion of less than ± 20 ps/nm per 100 km of the single mode transmission fiber.

10. The optical fiber of claim 1 wherein

the core outer radius ($r_1$) of the central core segment is between 1.6 and 1.8 microns; and

the outer radius ($r_2$) of the moat segment is between 4.6 and 5.0 microns.

11. The optical fiber of claim 9 wherein

the center radius ($r_3$) of the ring segment is between 6.5 and 7.2 microns.

12. The optical fiber of claim 1 wherein the ring segment includes a ring width ($W_r$) measured at one-half the relative refractive index ($\Delta_3$) of the ring segment wherein the ring segment is offset from the moat outer radius ($r_2$) by a ring offset ($X_o$) of greater than 0.75 μm, wherein $X_o = r_3 - r_2 - Wr/2$.

13. The optical fiber of claim 1 further comprising a core/moat ratio, defined as the core radius ($r_1$) divided by the moat outer radius ($r_2$) of greater than 0.32.

14. The optical fiber of claim 1 wherein an effective area ($A_{eff}$) at 1550 nm is greater than 15 $\mu m^2$.

15. The optical fiber of claim 1 wherein $\Delta 1$ is greater than 1.0 % and less than 2.0 %.

16. The optical fiber of claim 15 wherein $\Delta 2$ is less than –0.3 %.

17. The optical fiber of claim 16 wherein $\Delta 3$ is greater than 0.3 %.

18. The optical fiber of claim 1 further comprising a ring width (Wr) measured at one-half the relative refractive index ($\Delta_3$) of the ring segment of between 1.0 and 2.0 μm.

19. A dispersion compensating optical fiber, comprising:

a refractive index profile having

a central core segment with a relative refractive index ($\Delta_1$) between 2.0 % and 1.5 % and an outer radius ($r_1$) of between 1.6 and 1.8 μm,

a moat segment surrounding the central core segment with a relative refractive index ($\Delta_2$) of between -0.4 and -0.6 % and a moat outer radius ($r_2$) between 4.6 and 5.0 μm, and

a ring segment surrounding the moat segment with a relative refractive index ($\Delta_3$) of between 0.3 and 0.6 %, a ring radius ($r_3$) to a center of the ring segment of between 6.5 and 7.2 μm, and

the refractive index profile results in

a total dispersion of less than –114 ps/nm/km and greater than –143 ps/nm/km at a wavelength of 1550 nm, and

a kappa, defined as the total dispersion at 1550 nm divided by the dispersion slope at 1550 nm, of between 96 and 150 nm.

20. A dispersion compensating optical fiber, comprising:

a relative refractive index profile having

a central core segment with a relative refractive index ($\Delta_1$) between 1.5 % and 2.0 % and an outer radius ($r_1$) of between 1.6 and 1.8 μm,

a moat segment surrounding the central core segment with a relative refractive index ($\Delta_2$) of between -0.4 and -0.6 % and a moat outer radius ($r_2$) between 4.6 and 5.0 μm, and

a ring segment surrounding the moat segment with a relative refractive index ($\Delta_3$) of between 0.3 and 0.6 %, a ring radius ($r_3$) to a center of the ring segment of between 6.5 and 7.2 μm, a ring width ($W_r$) measured at one-half the relative refractive index ($\Delta_3$) of the ring segment of between 1.0 and 2.0 μm and wherein the ring segment is offset from the moat outer radius ($r_2$) by a ring offset ($X_o$) between of between 1.0 and 1.7 μm

wherein $X_o = r_3 - r_2 - Wr/2$, and

the relative refractive index profile results in

a total dispersion of less than –114 ps/nm/km and greater than –143 ps/nm/km at a wavelength of 1550 nm,

a total dispersion slope of less than -0.7 and greater than –1.5 ps/nm$^2$/km at a wavelength of 1550 nm; and

a kappa, defined as the total dispersion at 1550 nm divided by the dispersion slope at 1550 nm, of between 96 and 150 nm.